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NATURE
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VOL. I. NO. 1. MARCH, 1895.

# THE NATURALISTS' REVIEW,

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ARISTOTELI·STAGIRITAE

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# The Naturalists' Review

Vol. 1. MARCH, 1895. No. 1.

## Aristotle.

BY KELLOGG DURLAND.

Aristotle was born about 384 B.C. in Stageira, a Hellenic colony in Thrace, situated on the Strymonic gulf, a little north of the isthmus which terminates in the mountainous promontory of Athos. His father, Nichomacus, was a distinguished physician and author of medical works, and claimed being a descendant from the heroic *gens* of the Asklepoids. His mother, Phaestis, was one of the descendants of the first Chalkidian colonists.

We learn but little of the youth of Aristotle, aside from the fact that he lost his mother and father while very young, and then went under the guardianship of Proxemus, a native of Atarneus, but who had settled in Stageira. He was an extravagant youth; spent most of his paternal property and then joined the army. He soon become weary of that, however, and returned to Stageira, turning to account the surgical buildings, apparatus and medicines left by his father as a medical practitioner.

At the age of thirty he went to Athens and entered the school of Plato, where he remained until the death of the latter in 347 B.C., when he quit Athens with his fellow pupil, Xenocrates, and went to Atarneus, where he remained three years. Several years after he was invited by Philip into Macedonia to become preceptor to Prince Alexander,—then about thirteen years old. Here he remained until the death of Philip in 336 B.C., when he established a school in the eastern part of Athens near the temple of "Apollo Lykeins," and deriving from thence the name of Lykeium. He continued to lecture and teach here thirteen years, corresponding all the time with Alexander, Antipater, Themison, and others.

After the death of the great Macedonian conqueror in 323 B.C. Aristotle made many political enemies, so that he found it necessary to retire from Athens. His enemies, however, were persistent, and did all in their power to injure him, and for several years was rarely, if ever, free from personal slander.

Now, as we have a general idea of his life, let us glance at his works. He was the most voluminous, and generally deemed the most obscure, of all the Greek writers of classical antiquity. He treated on nearly every subject coming within the range of human thought. He initiated many new branches of inquiry dependent on observation and education, and was, as far as possible, the forerunner of modern science. His numerous works may almost have the credit of saving men from relapsing into barbarism. He was, without doubt, the first careful observer, dissector, and describer of

animal's minds. He was the first to divide the animal kingdom into classes.

He laid the foundation for Natural Philosophy, Physiology, and Natural History. On many subjects he is not authority. Nevertheless, his works are all well worth study for several reasons. First—On account of the important part they have borne in the history of the world. Second—If cultivation consists (as it does,) in the acquaintance of all the best productions of the human mind, Aristotle's works, despite their want of style, are classed among this number. Hegel advocated the study of these works as "the noblest problem of classical philology." The most popular of his books are "Organon," or Logic; "Rhetoric," "Poetics," "Ethics," "Politics," "History of Animals," "Physics," "Metaphysics," "Psychology," and "Meteorology."

Many books bearing his name are spurious, and it is only within the present century that the spurious began to be sifted from the genuine. The extraordinary and unmerited fate of these writings, while it excites the curiosity, must provoke the indignation of every friend to science. Few were published in his life time, and many perished through neglect.

Aristotle's manuscripts and library were willed to Theophrastus, who bequeathed them to Neleus, who gave them to some ignorant men who hid them in the ground where they remained for many generations a prey to dampness and to worms. At last, however, they were dug up and sold for a very large sum to one Apellicon, of Athens, a lover of books rather than a scholar. He it was who took upon himself the task of rewriting and revising these old manuscripts. Although it was performed in the same city where they were written it was very imperfectly done.

"What became of the original manuscripts is not known. They passed through many hands and ages. From the time of Andronicus's publications to the invention of printing, a succession of writers on civil and sacred subjects confirmed by their citations and criticisms the authenticity of most of the treatises still bearing Aristotle's name."

According to the most credible accounts, therefore, he composed above four hundred different treatises, of which only forty-eight have been transmitted to the present age. But many of these last consists of several books, and the whole of his remains together still form a golden stream of Greek erudition exceeding four times the collective bulk of the "Iliad" and "Odyssey."

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## Nature as I See It.

BY MORRIS RICE.

For several years I have been studying a book—a volume made up of poetry and prose.

The poetry is pure, tender, and sweet.

The prose, eloquent, earnest, and noble.

The title of this wonderful book is Nature.

It is a living book; the very words breathe, and each and every page tells a story in a language of its own.

We find the poetry in the birds,

in the beautiful flowers, the majestic mountains, the warm sunshine, and sometimes in the drifting clouds; they are all beautiful, living poems.

The prose we see in the tall, naked trees, in the great rivers, in the broad plains, and in the barren scene of a winter landscape; they are paragraphs of living prose.

Where can you find a sweeter verse than in a bunch of beautiful flowers; even their breath is poetry, divine poetry.

Did you ever look across one of those broad western prairies with the gigantic mountains in the background; does it not present a grand piece of prose?

What speaks more eloquently than a strip of woods in winter when the trees and shrubbery are covered with snow?

Have you ever thoughtfully studied bird-life; have you ever thought what delicate creatures some of them are?

How very beautiful and interesting they are — bits of verse swimming through the air; or as that noble writer, John Ruskin, has said:

"It is little more than a drift of air brought into form by plumes."

They are feathered verses from the Divine Hand.

"Sweet the song of the birds at dawning,
When the grass is wet with spangled dew."

Can you show me a more beautiful picture than an April sun rise, or anything more magnificent than an Autumn sunset?

This great book of Nature is replete with puzzles and secrets which require persistent and loving study to unravel,—each year, each season, will reveal something new.

The system of Nature is wonderful, poetic and sublime.

Her laws are mysterious and profound.

Through the mighty lion and sky-soaring bird down to the ugliest grub beneath the dead leaves, God speaks to us—to you!

The heart of man skims the surface of Nature, but the spirit seeks the inner passages.

Remember God has created nothing unworthy of observation and study.

The study of Nature promotes health, a kind disposition and noble thoughts.

Oliver Wendell Holmes has said: "I have written many verses but the best poems that I have produced are the trees that I have planted on the hill-side."

Nature is too varied to be uninteresting, too deep to produce narrowmindedness, and too grand to be easily forgotten.

Follow that excellent motto, "Keep your eyes open," and get a better understanding of Nature.

"Find tongues in trees, books in the running brooks, sermons in stones and good in everything."

For thousands of years we have searched and studied, and yet not half do we understand the most common things that surround us.

The wonders and beauties of creation are manifold, and knowledge has no limit.—*Natural Science News.*

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Three-fourths of the earth's surface cannot be cultivated on account of mountain ranges, desserts, swamps and barren ground.

# The Naturalists' Review,

DEVOTED EXCLUSIVELY TO NATURAL SCIENCE.

SHRIEVES & DURLAND, - Publishers,
52 BLUE HILL AVE., BOSTON.

MARCH, 1895.



ADVERTISING RATES.

12c. per nonpareil line.
12 lines one in.
50c. per in.
95c. per 2 in.
1-2 column $1.60.
1 column $3.00
1 page $5.00.
Ads. inserted for 3 mos. 10c. per line, 6 mos. 8c., 12 mos. 6c.
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Farrington Printing Co., Printers, 33 Beach St., Boston.

It is our intention to publish each month, a short biography of all the leading naturalists of the world. We commence this month with Aristotle. The picture is taken from Raphael, "the Shakespeare of the canvass."

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We wish to call attention to the "Protest Against Bird Slaughter" and the resolutions adopted by the Cooper Ornithological club. We trust all persons interested in Ornithology, will use their influence toward stopping that shameful practice of killing birds for millinery purposes. Charles Dudley Warner has said that a dead bird does not help the appearance of an ugly woman, and a pretty woman needs no such adornment.

"What will Lattin do next?" *Natural Science News* was a delightful surprise, filled with interesting, newsy articles.

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We quote from the *Nidiologist*. "I am glad to see that the nom de plume fashion is being largely done away with. An article or note of any scientific value is, to my mind, worthless thus signed. If a person is afraid to sign his or her name, it should not be published."

Hereafter we will make it a rule not to publish anything unless particularly interesting, thus signed.

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If any of our readers come across any interesting article on Natural History, in any paper or magazine, we shall be grateful if they will kindly send it to us.

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Next month we will have a design for the cover of THE REVIEW.

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The wonderful East Indian statues and temples cut from the solid bowlders and stratified rock are duplicated if not excelled by the Afghans. Prof. J. A. Gay, in one of his recent lectures on the far east, tells of the stone statue of a god which he saw at Bamian, near the Russian frontier. This particular statue was one of a score, but was the giant of the lot, being 173 feet in hight and large in proportion. It was used as a storehouse for grain, and at that time contained over 2000 bushels.

## "The Glass or Joint Snake."

*Ophisaurus ventralis.*

Stories concerning the "glass snake" are so numerous and so marvelous that one might feel justified in doubting the reptiles existence and classing it with the chimaeras, dragons and griffins of mythology. There is, however, a real, living and breathing animal which forms a basis for these stories, and the properties of this animal are so wonderful that they explain the origin of the stories, although they do not excuse the exaggeration

Casting aside the thick veils of fable and fictitious names, and viewing the animal by the light of science, we discover that although long, slender, snake-like and destitute of limbs it is not a snake at all, but a lizard.

It is not the presence of limbs which distinguishes the order of *Lacertilia* from that of *Ophidia*, for, contrary to the generally accepted opinion, there are snakes with legs, rudimentary ones at least, and lizards without even the rudiments of them.

Though destitute of limbs the *Ophisaurus* would never be mistaken for a snake by any careful observer. The bones of a snake's brain case are firmly ankylosed together—those of the lizard are less firmly united. The snake's upper and lower jaw are so loosely jointed together that it can swallow objects with a diameter greater than its own, while the jaws of the lizard are so firmly connected that the mouth is not distensible. The sides of the lower jaw of a snake are joined together by a flexible cartilage, so that each side may be advanced or withdrawn independent of the other, while the rami of a lizard's jaw are firmly united at their symphysis so that the sides must move together. The eyes of snakes have no movable lids so that it seems always looking about with a fixed, stony stare, while the eyes of the lizard have movable lids, and its frequent, rapid winking gives it a brisk and cunning look. Snakes have no apparent ears, while the ear openings of the *Ophisauras* are plainly visible, being on a line with the mouth, and somewhat larger than the nostril.

The *Ophisauri* have from fourteen to sixteen longitudinal rows of scales, very much like those of snakes, but instead of thebroad plates which cover the ventral surfaces of *Ophidians* they have the under parts of their bodies sheathed, like their backs, in small scales arranged in about 120 transverse rows from the head to the vent.

The head of the *Ophisauras* is small and narrow, tapering to a long, round-tipped snout which may be of service in burrowing. The head is attached directly to the body without any distinct neck.

Of two specimens kept by me one was marked on the upper surface by narrow lines of dark brown on a ground of greenish olive which shaded into a polished slate color on the ventral surface. The other was almost black on its dorsal surface and was destitute of spots, their place being taken by longitudinal rows of whitish, occellated spots. The lower jaws of both specimens were sulphur yellow, shading into a darker hue, approaching orange. Their heads

was very dark olive, with mottlings of sooty black.

Near the center of the dark interparietal plate of each was a minute white spot, the so-called pineal eye, supposed to be the abortive relic of the third eye which some remote ancestor carried in the top of his head. It has been suggested that this pineal eye may still be sensitive to light, though such is probably not the case.

Like most lizards my "glass snakes" were shy and timid and did not take kindly to petting at first. Still they made no demonstration of hostility, except when first captured and then their efforts to bite were very feeble. Needless to say their bites can do no damage, for the gape of their jaws is small, and their teeth are very small and weak. One of them was fifteen and the other twenty inches in length, though they are said to attain a length of three feet.

The tail of the *Ophisauras* is extremely long, being about twice the length of the head and body, and, like other lizards, it is liable to lose its tail. A very slight blow will suffice to break off the tail of almost any lizard, and the detached tail will writhe and flap about in the throes of death, often springing several inches from the ground, while the owner darts away to some place of concealment, where it rapidly recovers and soon grows another tail. The student and collector soon learns the fruitlessness of catching such animals by their tails.

The great length of the tail of *Ophisaurus* makes the facility with which the creature parts with it seem remarkable, for it is really startling to see an animal lose two thirds of its length and still wriggle off undismayed. It is said that the tail when broken from the body will itself divide up into several squirming pieces, though I have never witnessed this myself.

Among people not accustomed to make nice distinctions among reptiles the *Ophisaurus* is invariably regarded as a snake, and the sight of a "snake" breaking into two or more pieces on receiving a slight blow, and the shortest of these fragments escaping is a phenomenon demanding explanation. It is always easier to "jump at conclusions" and to take things for granted than to reason and investigate, so it is assumed that this "snake" having the power of apparently voluntarily dividing itself up must necessarily be able to reunite its fragments with equal facility.

In spite of its utter absurdity this view is apparently accepted, and whenever the partial destruction of an *Ophisaurus* is witnessed the imagination is called upon to account for the phenomenon, as the facts are embellished and explained until the poor little lizard seems entitled to rank with the Phœnix.

Although so many people believe that the "joint snake" or "glass snake" re-unites its shattered fragments there are but few who have the patience to wait and see this done, or the hardihood to say they have seen it. Those who tell these stories, often in good faith, usually add that they gained their information at second hand, but there was one contributor to the *Scientific American* who claimed that he had witnessed the feat himself. The difficulties in

the way of fitting together shattered nerves, blood vessels, and bundles of muscular fibres so that the restored animal will be ready for business on short notice are so great that it is difficult to suspend judgment while waiting for the story to be corroborated.

The *Ophisaurus* is occasionally, though rarely, found near Vincennes, and is thought to be sparsely distributed throughout Indiana, though its ordinary habitat is farther south. It is to the southern States, then, we must look for information regarding its breeding habits and general life history, subjects concerning which we are entirely ignorant.—*Natural Science News.*

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## Ants.

Ants, with bees, wasps and gall-flies belong to that order of insects called hymenoptera, a word which means membrane-wing.

They are divided into three classes: The females, which are the largest, the males which are next in size, and the neuters, which include the workers and soldiers. Those belonging to the third class are wingless.

Ants hive in communities in homes termed formicaries. The building and caring for the formicaries is done by the workers.

The males soon die without having done any of the work of the common house. The females scatter tiny eggs about the nest. These eggs are gathered up by the workers, who carefully put them away safely until they are hatched. When the grub comes from the egg it is without legs and cannot move about, but is nursed and fed by the workers until it becomes large enough to spin a cocoon. It remains in the quiescent or pupa stage but a short time after which the workers cut the cocoon and help the ant to emerge from it.

The lighter colored red ants often make war upon black ants. They attack a colony of black ants and being the better fighters, drive the black ones away, enter their home and carry away eggs or larvæ which they bring up to do the drudgery of the colony, and to be the slaves of their lighter colored masters. Ants which engage in slavery become degraded and helpless by so doing. They can, to be sure, still engage in fighting to some extent, but they have become so dependent upon their slaves as to undergo a degeneration of structure and a loss of part of their instincts. Sir John Lubbock, in his "Ants, Bees and Wasps," speaks of a species of ant which strikingly shows the tendency of slavery. Their mandibles have lost their teeth; they have lost the power of building; they do not care for their young; if the colony is to be moved, they are carried from one place to another on the backs of their slaves, and have even lost the power of feeding themselves.

Ants domesticate other insects. They collect the eggs of the aphis, or plant louse, and care for them, rear them and keep them in their nests. The aphides yield a sweet, sticky fluid which they excrete after being stroked and caressed by the ants, who have brought them up and protected them for the sake of procuring this honey like liquid. The ants often have in their house a beetle which seems to be dependent upon the

ants for feeding and protecting it. It is probable that this beetle exudes, from tufts of hairs at the base of the wing covers, a sweet substance of which the ants are fond.

Of the many kinds of ants found all over the world, one of the most interesting, perhaps, is the agricultural ant of Texas, which has been most carefully observed by Rev. Henry C. McCook of Philadelphia.

The formicaries of these ants are beneath the ground, and present upon the surface, in many cases, a flat circular disk from seven to twelve feet in diameter, or sometimes the upper portion of the nest is a mound or cone. They build only where there is sunlight. However, while they prefer to have their dwellings in bright sunny places they are not themselves fond of the scorching heat of the noonday sun which is excessive in that part of the country in which they live, and between the hours of eleven and one, seek shelter within their houses.

In order to make a clearing about their nests, they cut down the grass which grows about it, leaving the stumps of grass stalks standing. The soil is then removed from the roots which can then no longer keep their hold in the ground.

Roads from two to five feet in width which gradually narrow, lead out in several directions from the clearing. One of these roads, which forked two feet from its mouth, was found to be sixty feet long. These roads, which are used as avenues of communication with the harvest grounds, are hard, level and smooth, and with considerable expenditure of labor on the part of the ants, are kept clear.

These ants are remarkable for the care which they exercise in the gathering and storing of grain. While watching one of these ant settlements, two columns of ants may be seen on a road, one outgoing and another incoming, laden with the seeds of various grasses, chiefly buffalo grass which they carry into the formicary through one of the several gates.

Much care is taken in the selection of these seeds, the ants choosing only the ripe ones. If any imperfect seeds happen to be carried to the formicaries, they are left outside the gates. The seeds of the buffalo grass and ant rice are stored in the galleries of the nests several feet below the surface of the ground. It has been found that the seeds in the upper granaries were mostly within their shells, while those in the lower rooms were husked and some quite green. They store these seeds for winter provision.

Grain is cultivated by the agricultural ants in so far as they keep the ground clear of weeds which would crowd their favorite plants, and after they have harvested the grain, they cut away and remove the dry stems and roots that the soil may be ready for the next year's crop. It has not been proven that they actually sow seed, but it is probable that the crop is sown each year by the seeds which naturally drop from the plant; or are dropped or cast out by the ants.

Sometimes rain gets into the store rooms, and the ants bring to the surface quantities of wet seed which are spread out to dry and are later put back in the graneries.

If the moisture has caused any of the seeds to sprout, such are not put back in the store houses after drying.

A study of the industry, methods of working, eating, migrating, caring for the toilet, burying the dead members of the colony and many other interesting habits of the Texan agricultural ant, as well as an inquiry regarding the habits of other ants, will lead one to believe that, were intelligence and physiological characteristics made the basis of classification, rather than structure, ants (Formicidæ) would rank higher than some vertebrates. *F. Z.*

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## The Position of Geology.

BY PROF. JOSEPH PRESTWICH, F. R. S.

The position of geology in this country at the present time, more especially as relates to the later geological periods, is anomalous and possibly without precedent. On one side its advance is barred by the doctrine of uniformity, and on the other side by the teaching of physicists. The former requires that everything should be regulated by a martinet measure of time and change. It asserts that the vast changes on the earth's surface, effected during long geological periods, are to be measured by the rate at which similar but minor changes are effected in the present day, and that the agencies now modifying the surface have been alike, in every respect, in all past time. It is true that no restriction is placed on the extent of the changes, but such prolonged time is insisted on for their accomplishment as to destroy the value of the concession. Not that time is in itself a difficulty, but a time rate, assumed on very insufficient grounds, is used as a master key, whether or not it fits, to unravel all difficulties. What if it were suggested that the brick-built Pyramid of Hawara had been laid brick by brick by a single workman? Given time, this would not be beyond the bonds of possibility. But Nature, like the Pharaohs, had greater forces at her command to do the work better and more expeditiously than is admitted by the uniformitarians.

On the other side, physicists would lead us to suppose that those great movements of the earth's crust, with which we are all familiar in the form of high mountains and continental upheavals in the earlier stages of the earth's history, were impossible in those times which more immediately approached our own. They maintain that if the earth is not solid throughout, its outer crust at least must have now attained a thickness estimated to vary from eight hundred to twenty-five hundred miles, and is so rigid that we are forced to believe that for a long preceding period it must have been in a state of comparatively stable equilibrium. This, however, would have rendered the great earth movements, considered by geologists to have continued up to the threshold of our own times impossible. And to this finding the physicists would have geological speculations conform. At the same time, judging among other reasons, from the rate of cooling of hot solid bodies, they would assign a much shorter time to the earth's history since it became habitable than is compatible

with the views of the uniformitarian school of geologists. The one side counts in round numbers upon some three hundred million years; the other sees no reason to go beyond fifteen to twenty million years—a term, in our humble opinion, much more probable than the other.

On another point our two allies (allies in the sense of the working at the same subject) are in irreconcilable antagonism. The physicists tell us that uniformity of action in all times is impossible, while the uniformitarians say that such a shortening of geological time as would follow on the acceptance of the physical argument is against all geological experience. Not only do these opinions clash, but those also concerning the rigidity of the earth and the thickness of its crust are widely divergent. None of these contentions can, however, be disregarded, for we must all recognize the importance of considering the question from every point of view. The argument in favor of uniformity of action has been put before us with so much skill and ability, and possessing as it does the charm of an infallible faith, that uniformitarianism has become the accepted doctrine of the dominant school of geology. Besides, within certain limits and in certain lights, the arguments of the uniformitarian and of the physicist might hold good—that is to say, if we would restrict the deductions of the former to the recent period, and could adopt the propositions of the latter. Our part, however, is to see whether their conclusions agree—not with their respective assumptions, but with the geological evidence; for no conclusion can be accepted that do not meet with the full concurrence of all the copartners interested in the result, and without respect for their mutual claims progress is not possible. The geologist must attend to the claims of the physicist, and the physicist ought not to overlook those of the geologist. How then stands the case?

With regard to the geological problem, we are told by the uniformitarians that the forces acting on the surface of the globe have been in all past times the same, both in kind and degree, as those now in operation. On those grounds they have proceeded to estimate, first, the time required for mountain and continental elevation; secondly, the rate of erosion of the valleys, and of the denudation or lowering of the land. Their conjecture is that our limited experience of two thousand to three thousand years has sufficed to furnish us with instances of all the various vicissitudes and changes that the earth has undergone during the illimitable past—a generalization incompatible with what is known of the evolution of the earth, and in contradiction to their own premises.

For even geologists who recognize no change admit the original molten state of the globe. This of itself involves, in the cooling of the mass the intervention of stresses and strains, with their consequences, which render it inconceivable that there was nothing in all those stages of the world's history beyond what our limited experience has brought us in contact with.

Although the consumption of the uniformitarians on the question

degree may be disputed, that on the question of kind admits of no dispute. That rivers excavate and currents distribute the excavated materials, and that the land is mobile and subject to changes of level, no one will contest. The point of contention is the rate at which these operations and changes proceeded formerly as compared with the rate at the present day. The many observations made on the erosive and transporting power of rivers, and on the movements and waste of the land, are admirable as far as they apply to the silting up of ports, the recession of the coast and the reclamation of marsh lands; but, though valuable to the engineer, they are misleading to the geologist. They furnish him, it is true, with standards applicable to present changes, and indicate the method in which the erosive power of the rivers and seas has acted in all time, but they give no measure of the amount and rate of work they did at different periods. Nevertheless, knowing what at present is accomplished by their means, it is reasonable to judge, by ascertaining what their agency accomplished in former days, of the difference of the forces in operation at the several periods. Those forces have to be estimated by the work done in the past, and not by any fixed rate founded upon present work.

Few geologists would, we presume, contest this position; notwithstanding which, and though many now profess a modified uniformitarianism, the old lines of argument still, with few exceptions prevail, and the concessions made are more apparent than real, or are of little value. In our opinion, no partial concession can be entertained on the question of degree. It must be an unconditional surrender; for, in contradistinction to method, or manner, where we are on common ground, no common scale on the question of degree is possible in judging of the past by comparison with the present.

As an example of the present position, we may take one argument as presented by the advocates of the uniformitarian school. The observations on the transportating power of the large rivers of the world have shown that the quantity of sediment carried down by them to the sea is, according to one of their estimates, such as would suffice to lower the level of the land about one foot in six thousand years, or about a thousand feet in six million years. Exception might be taken to this estimate in that no account is taken of the calcareous matter removed in solution, which in fact, is not far from the quantity of insoluble matter carried down mechanically. Let that pass. This measure, or one approximate to it, has been very generally accepted, and is in common use. Hence those geologists proceeding solely on the assumed postulate, and not attaching due weight to other considerations, have, it seems to us, placed the later Quarternary times at far too great a distance from the present. In the same way, the ratio at which the elevation of the land took place having been estimated on the mean of two and a half feet a century, would if that scale were accepted, manifestly push back to a very remote distance even later geological changes.

The importance of determining these points more accurately became more evident when it was discovered that man existed with the extinct mammalia; and there-

fore upon the solution of the time-rate problem depended the determination of the antiquity of man upon the earth. Various have been the attempts since made; but, as they have almost all been made upon measurements based on the above named scales, they necessarily involved a very free use of time.

For long, geologists had held to the belief, prevailing half a century ago, that man could not have existed on earth for more than five to six thousand years. When evidence was given, and at last accepted, to prove a higher antiquity, the uniformitarians were placed in the difficulty of proving too little or too much.

If they adopted a short chronology, it would clash with the corner stone of their belief as to the age of the Quarternary deposits; if, on the other hand they retain their belief in the great length of time they held to be necessary for the formation of the post or later glacial deposits, they would have to assign to man an antiquity which would clash sorely not only with their own previous belief, but also with that held on various grounds by other geologists and anthropologists.

—*Exchanger's Monthly.*

## Protest Against Bird Slaughter.

At the November meeting of the Cooper Ornithological Club of California held at San Jose, Cal. resolutions were adopted condemning the practice of slaughtering many beautiful birds for millinery purposes. The resolutions are as follows :

*Resolved*, That the Cooper Ornithological Club deplore and condemn the perverted taste and cruelty of the fair sex in fostering the slaughter of thousands of Egrets (for their plumes) and countless numbers of other birds of song and beauty, for millinery purposes; and that we especially condemn the shooting of gulls and terns on the shores of San Francisco Bay, as well as snowy plover, and other shore birds along the coast, and the wholesale slaughter along the Colorado River, the breeding grounds of numerous species, which are being exterminated by Indians employed by unscrupulous whites; that we view with alarm the appalling fact that more birds are destroyed annually in the United States for each large millinery firm than are contained in the combined collections of bird students in this country—the accumulation of generations. And be it further

*Resolved*, That every means be put forth to influence legislation for the protection of birds, and to discourage the wearing of birds, resulting in such shameful annihilation of the beautiful creatures of the air, the common, inalienable heritage of all who love Nature, and her children of hill and valley, wood and shore. And be it further

*Resolved*, That a copy of these resolutions be sent to the intelligent and generous press, who may assist in the elimination of this execrable evil of fashion.

## Swallows.

Very little has been written about this very interesting family of birds, and I take upon myself the pleasing task of evolving what facts concerning them have come to my knowledge. For a long time the ridiculous idea that Swal-

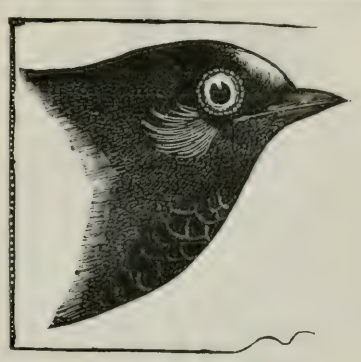
lows hibernated like the frog or eel was prevalent, and was accepted as gospel truth (or at least was not doubted) until Audubon systematically set to work to clear up the mystery, and finally established the fact that they were migratory.

The first member of this family to which I refer is the Chimney Swift (*Chætura pelagica*), very frequently called Chimney Swallow. The first record of their appearance here this year was the 27th of April, at which time I observed three in company with one Cliff Swallow. The following week the air was fairly alive with them, as well as Barn and Cliff Swallows. Nesting takes place in May and June. I have a set, however, taken July 6th. The eggs are pure white, though very frequently blackened by the soot from the chimney. One egg in my collection, taken in 1891, is so discolored by soot that it is hardly recognizable. I found one nest of eggs in the middle of August containing two young birds and three eggs.

The nest is always placed so far down the chimney that the sun never reaches the eggs, and my experience has been that the nest is built facing the East, although I am not sure that this is always the case, or whether it was merely accident in the cases which have come under my notice. The nest is built in the form of a semicircle, and is made of small, dead twigs of nearly the same length, strongly glued together and securely fastened to the wall by the saliva of the birds. This, when dry, becomes a compact mass, and when the nest is separated from the chimney portions of the brick will often adhere. If the first nest is destroyed a second one is frequently constructed in its stead.

A peculiar incident is recorded by George H. Davis of Painesville, Ohio, in which a Chimney Swift was impaled on the sharp point of a lightning-rod while attempting to enter the chimney. It is probable, as he says, that a sudden gust of wind forced it against the death-dealing point, which thus became a life-destroyer instead of a preserver.

The Cliff Swallow (*Petrochelidon lunifrons*) is the most abundant in



CLIFF SWALLOW.

this section of any of the family. It is also known by the additional cognomens of "Republicans" and "Eave Swallows." Many collectors of some experience know them only by the title of Eave Swallows, and I must confess that I also was among that number in the early days of my collecting. The nest is shaped something like a bottle and composed entirely of mud, well-lined with straw and feathers. The eggs are white and are marked with dots, blotches and points of reddish-brown, chiefly around the larger end. Eggs are usually five in number. I observed Cliff Swallows on April 27th for the first time this sea-

son, and my last record of them is October 5th.

The Barn Swallow (*Chelidon erythogaster*) is readily known, when on the wing or otherwise, by its beautiful plumage and deeply-forked tail. The nest is a bowl-shaped structure and is com-

BARN SWALLOW.

posed of mud, mixed with straw and lined with feathers. It is attached (something after the manner of the nest of the Chimney Swift) to the rafters within barns. The eggs are pure white, marked with spots and blotches of bright reddish brown. The eggs are usually four or five in number and average .75x.55.

The Bank Swallow (*Clivicola riparia*), or sand Martin, is very

BANK SWALLOW.

abundant all over North America. The birds usually nest in companies, though frequently in pairs of two or three. The nest is placed in a hole in the bank, from two to four feet in depth, though two or two and a half is the average in this locality. The eggs are pure white and five usually forms a complement, though four and six, and even seven (in rare instances), are found. The average size is .71x.50.

The family of Swallows as a whole, present a fine appearance on the wing. It is a pleasure, worth a considerable effort to secure, to observe a colony of Swallows in search of food just before sunset of a fine July day. Hither and thither they dive in pursuit of insects, in a most erratic and yet pleasing manner. They vie with and even surpass the lightning-like movements of the nighthawk. Swallows are excellent weather prophets. When seen darting or skimming to the fields of water it is a sure harbinger of the approaching storm; while, when they aspire to higher flight, it is sure to be the opposite.—FREDERIC W. PARKHURST, Bath, N. Y., in the *Naturalist*.

## Chips.

The largest mammoth found in Siberia measured seventeen feet long and ten feet high. The tusks weighed three hundred and sixty pounds.

Several kinds of birds are known to follow cows, horses, and other stock about the pasture for the purpose of feeding on the insects disturbed by the feet of these animals.

In boring an artesian well at Eureka, Cal., they found charred wood at a depth of 500 feet, and at 580 feet took out shells and a portion of a skeleton of a bird.

## Natural Preservation of Leaves, Ferns, and Other Vegetable and Animal Remains.

J. HOBERT EGBERT, A. M., M. D., Ph. D.

During a recent trip through southwestern Missouri the writer found a most interesting deposit of calcareous tufa and secured a number of beautiful specimens. Calcareous tufa is a rather widely diffused mineral owing to the large number of calcareous springs—in the neighborhood of which it is most frequently found. A description of the deposit in question may serve as an interesting key to similar mineral formations and also render the explanation of our observations and analysis more entertaining.

Well up in the mountains of Cedar county, Missouri, near the border of Polk county, we found an insignificant little spring, the water of which after reaching the surface incrusts animal and vegetable remains and congeals masses of dead leaves and other debris over which it flows into a stony mass. The water emanating from the spring flows down a steep incline and seems to make its most abundant mineral deposit about twenty-five feet from the spring. The process of incrustation takes place quite rapidly—it simply being necessary for a bunch of dried leaves, or other vegetable or animal debris, to remain in a pool of water or in the current of its flow a few months ere the entire mass is solidified—each particle of vegetation, etc., entering into the mass, preserving its characteristic form and outline. The process, as I observed it at intervals during a period of five weeks on a selected bunch of dried leaves, begins by a slimy deposit on the surface of the vegetation, which deposit continues to increase in size and density until each leaf is well preserved in a hard and somewhat thickened condition—its outline being maintained, even to minute detail. All leaves and debris that remain in the water-course—which has no definite boundaries but spreads out over the hard soil of the mountain side — are likewise treated, and those that are collected in masses become united together by a spongy deposit which ultimately dries and hardens. Thus in a single mass one may find leaves of all the trees common in the vicinity—oak, ash, sycamore etc.; also ferns, broken twigs, and feathers of birds.

As already mentioned this mineral deposit is known to geologists as calcareous tufa or tufaceous limestone. In composition it is nearly identical with common limestone and marble, but is distinguished by its spongy and porous structure. A careful examination of the deposit we have just described shows it to consist almost entirely of carbonate of lime, with a small amount of clay. It contains neither magnesia nor iron except such as exist in the clay or foreign material. The carbonate of lime is deposited from the water in the spring after its carbonic acid gas is liberated, and the process of incrustation is accelerated by the spreading out of the water after reaching the surface of the ground and by the rays of the sun which play upon the mountain on this, its southeastern exposure, during most of the day. The water of the spring is what is known as "a moderately hard lime water," is clear and sweet and not objectionable for drinking purposes.

In this part of Missouri—the southwestern— both the student

of natural Science and the collector of curios may find much to interest and instruct.

Indian relics are still to be found in considerable variety and numbers. In the district in question one may quite easily obtain quantities of arrow heads, spear-points, stone knives, fragments of pottery, etc. On one small hill, or mound, about eight miles east of the spring just described, we found a vertical arrow-head factory. In the surface soil of this hill, white flint is very abundant and may be found in all sizes from huge rocks down to fine chips. On top the ground the chips are especially numerous and upon inspecting these somewhat closely it was found that many of them had been worked into special forms. In fact pieces of Indian arrow-heads were strewn all over the hill. Tips, butts, barbs, half-made heads, etc., could be picked up in numbers, but only a few unbroken and well-formed specimens were found. Imperfect spear points and fragments of other stone implements were also taken from the hills. From the abundance of these imperfect specimens and the dearth of good ones—as well as from the evidence of stone-working as manifested by the innumerable small chips—it is reasonable to conclude that this was a favorite spot for the manufacture of stone weapons by a race of people now almost extinct. The place is most favorable for camping. Just north of this hill rises another, and between the two flows a beautiful stream of clear spring water. The space between the foot of the hills has, in places, a width of about 300 yards, in others, not more than 50 feet. This narrow valley with its trees and verdant grasses probably furnished the ground upon which the wigwams were pitched. Here the old men and young braves doubtless fashioned the hunting and war arrows and spears for the hunters and warriors of the tribe.

Numerous Indian graves have been found on the adjoining hillside.—*Museum.*

118 South St., Holyoke, Mass.

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## Vanilla and its Cultivation.

BY F. H. KNOWLTON, PH. D.

We are so accustomed to speak of vanilla as the product of the "vanilla bean," that perhaps few persons are aware that it has no connection with either the bean or the bean family, but it is produced by a beautiful, sweet-scented, climbing orchid. This widespread error doubtless arose from the fact that the vanilla capsule or pod, which is slender, from 6 to 10 inches long and only $\frac{3}{8}$ of an inch in diameter, has a vague resemblance to certain bean-pods. It is much more like the pod of the so-called catalpa bean, which also has nothing to do with the true bean-family, being a begonia or trumpet-flower. The name is, however, too firmly fixed in popular language to attempt to change it.

The orchid producing the vanilla bean is known by botanists as *Vanilla planifolia*, and is a native of Mexico and tropical America. It has a thick, fleshy stem, oval alternate fleshy leaves, and a short spike of numerous white or greenish white sweet-smelling flowers that are curiously irregular in shape, like those in most of the orchids. The plant climbs over trees and shrubs by means of numerous slender rootlets sent out from each joint of the stem.

which cling to the bark or other support. It was formerly supposed that this orchid, like so many of its relatives, was an epiphyte, that it grew upon other plants, but derived its nourishment wholly from the air; but it is now known that such is not the case. It maintains connection with the soil throughout its whole life, especially by means of the rootlets which in the lower portion of the stem reach the ground. In its wild state it climbs fifteen or twenty feet high, but in cultivation it is usually kept down within easy reach of the cultivator, for much care must be taken not to injure the unripe pods.

The vanilla plant is always propagated by means of cuttings. In Mexico where it has been cultivated for nearly or quite a century, it is customary to take portions of the stems two or three feet long. The leaves are removed from several of the lower joints and usually three joints are laid under the soil and covered to a depth of two or three inches, and the upper portion trained against the support prepared for it. The soil has to be especially prepared by trenching to a depth of 18 inches and must have a perfect drainage. The best soil is said to consist of fine rich loam mixed with equal parts of sand and leaf-mold.

Something must be provided for the vanilla plant to climb over, and rough-barked, living trees are perhaps the best; but almost anything such as rough, branching trees, trellis-work, stone pillars or stone walls, may be utilized. The plants are best grown in moderate shade, yet a certain amount of sunshine is required to ripen the pod.

In its native country the vanilla flowers are fertilized by insects. That is the flowers are so constructed that it is absolutely impossible for the pollen to reach the stigma or immature pod without external aid, and this office in Mexico and Central America is performed by a peculiarly constructed moth that visits the flower for the nectar always present. The pollen mass consists of thousands of little grains tied loosely together by delicate, cobwebby hairs. The mass has a sticky disk that adheres to anything touching it and is torn bodily from its pocket.

When the vanilla plant was first introduced into the West and East Indies it proved for a time a great disappointment. The plants grew vigorously and produced an abundance of fine flowers but no pods. All sorts of expedients were tried in the way of cultivation, but to no avail, and the cultivation was about to be abandoned, when the fact was discovered that the particular moth that fertilized it in Mexico was absent from its new home and consequently the plants were not able to set pods. After this, artificial pollinization was resorted to, and the pods were produced in characteristic abundance. The instrument with which this is accomplished may be a long needle or splint of bamboo, four or five inches long. It requires only a moment to do this, and one person may properly fertilize as many as a thousand flowers in a single morning.

The plants usually begin to flower the second year after planting, but do not reach maturity until the third and fourth years. The pods require a month to reach full size and six months more in which to ripen. The proper time for gathering the pods is determined by the appearance of a slight yellow tinge at one end or when they crackle

slightly when pinched between the fingers. The process of curing is a long and somewhat complicated one, requiring in some cases as long as three months. Curiously enough the aroma of vanilla is said not to pre-exist in the pods, but to be produced by a process of fermentation. In Reunion, where it is extensively cultivated, the pods are placed in a basket and plunged for half a minute into very hot, but not quite boiling water. They are then placed on mats to drain, after which for the next six or eight days, they are exposed, between woolen blankets, to the sun, but kept in closed tin boxes during the night to undergo a slight fermentation. When the pods have become brown and soft they are placed in the shade to dry, care being taken that they do not mold. Daily they are carefully pressed between the fingers, slightly anointed with oil, which renders them supple and lustrous. When the pods are perfectly cured they are of a rich, dark chocolate color, pliable in texture, and perfectly free from moisture.

In Mexico the curing is somewhat different. After gathering, the pods are placed under sheds in heaps until they begin to shrivel. Then they are allowed to ferment slightly, after which they are exposed to the sun in woolen blankets during the day and kept in air-tight tin boxes at night. At the end of a day or a day and a half they have assumed a rich, chocolate brown color. They are then placed in the sun for two months or more to dry, at the end of which time they are, like the others spoken of, pliable and free from moisture.

When finally prepared the pods are sorted according to lengths and tied up in bundles of fifty and the bundles are packed in air-tight tin boxes. When properly prepared, and in what is called "prime condition" the vanilla pods become covered with a frosting of little needle-like crystals of vanillic acid, are soft when pressed between the fingers and give off the characteristic balsamic odor.

The perfume or essence is extracted from the vanilla pod by prolonged soaking in alcohol. The proper proportion is about ½ pound of pods to each gallon of 60 per cent alcohol. The pods are cut up into small pieces and should stand for a month with an occasional shaking, when all worth extracting will be found in the alcohol.

A word as to the sources of supply and quantities used may be of interest. The cities of New York, London and Paris may be regarded as the vanilla markets of the world. The supply sent to New York is produced in Mexico, and is regarded as the finest quality grown. The amount imported in 1891 was 135,875 pounds. The Pacific coast and western portions of the United States obtain a part of their supply from the Island of Tahiti and the Sandwich Islands, but the quantity imported in 1891 was only about 5,000 pounds. The quality is much inferior to the Mexican.

The London supply is obtained largely from Mauritius and Seychelles, but the raising of vanilla has never assumed much importance in any of the English colonies.

The greater part of the vanilla imported into France comes from Reunion. In 1880 the amount was 164,289 pounds and in 1889 it had increased to 506,463 pounds, or more than twice the product of the rest of the world.—*Popular Science News.*

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